

JUNE 10, 1976

(EDITORS: THIS IS THE SECOND OF TWO SCIENCE NOTEBOOKS DEVOTED EXCLUSIVELY TO THE VIKING LANDING ON MARS, SCHEDULED FOR JULY FOURTH. SERVICES MAY USE THE INDIVIDUAL ITEMS BEFORE THE LANDING, ALTHOUGH SOME OF THEM WILL BE SUITABLE FOR LATER USE, ALSO)

1. VIKING LANDING SITES (DOSA)
2. VIKING SCIENCE (DOSA)
3. THE SEARCH FOR LIFE (DOSA)
4. MARTIAN PHOTOGRAPHY (DOSA)
5. MARTIAN METEOROLOGY OBSERVATIONS (DOSA)

ANNCR: THE VOICE OF AMERICA PRESENTS... SCIENCE NOTEBOOK ...A SUMMARY OF EVENTS IN SCIENCE, MEDICINE AND TECHNOLOGY. EACH WEEK AT THIS TIME, WE BRING YOU REPORTS ON DEVELOPMENTS THAT MAY AFFECT OUR DAILY LIVES. WITH THE FIRST STORY, HERE IS YOUR SCIENCE EDITOR -----.

(VIKING LANDING SITES -- 3-3576 -- DOSA)

EDITOR: THE INTENDED LANDING SITE FOR THE FIRST U-S VIKING EN ROUTE TO MARS IS ONE OF SEVERAL LOCATIONS CONSIDERED AS SUITABLE DESTINATIONS FOR A VISITING SCIENTIFIC LABORATORY FROM PLANET EARTH. HERE IS ----- WITH A LOOK AT THE VIKING LANDING SITES.

VOICE: THE LANDING SITES WERE CHOSEN AFTER A THREE YEAR STUDY OF TWENTY-TWO CANDIDATE SITES BY TEAMS OF PROMINENT SCIENTISTS. THE DECIDING FACTOR IN THE SELECTION WAS THE SCIENTIFIC INTEREST AND THE PROBABILITY OF A SAFE AND SUCCESSFUL LANDING. DATA OBTAINED BY RADAR ON EARTH HELPED THE SCIENTISTS PICK THE VIKING LANDING SITES, BUT THEIR MOST IMPORTANT TOOL HAS BEEN THE THOUSANDS OF MARTIAN PHOTOGRAPHS TAKEN OVER A YEAR'S TIME BY THE AMERICAN MARINER NINE FROM ORBIT AROUND THE PLANET.

VOICE: THE MARINER PHOTOGRAPHS WERE CORRELATED WITH TEMPERATURE,
(CONT'D) AIR PRESSURE, HUMIDITY AND SURFACE DATA COLLECTED BY REMOTE SENSING INSTRUMENTS ABOARD THAT SPACECRAFT. AND, LITTLE MORE THAN ONE MONTH BEFORE THE FIRST VIKING LANDING, THE BIGGEST RADIOTELESCOPES ON EARTH HAVE BEEN POINTED TOWARD MARS TO OBTAIN ADDITIONAL RADAR INFORMATION ABOUT THE LANDING SITES. THE FINAL DECISION ON WHERE TO TOUCH DOWN WILL BE MADE ONLY DAYS BEFORE THE LANDING, AFTER A THOROUGH STUDY OF NEW PHOTOGRAPHS TAKEN BY VIKING ITSELF.

THE NUMBER ONE CHOICE FOR THE FIRST VIKING LANDING IS A PLACE CALLED CHRYSE, LOCATED AT NINETEEN-AND-A-HALF DEGREES NORTH LATITUDE AND THIRTY-FOUR DEGREES WEST LONGITUDE. ON PLANET EARTH, THAT WOULD BE IN THE MIDDLE OF THE ATLANTIC OCEAN. ON PLANET MARS, CHRYSE IS AT THE LOWER END OF A VALLEY, NEAR THE NORTHEASTERN END OF THE VALLES MARINERIS CANYON.

VALLES MARINERIS IS A FOUR-THOUSAND KILOMETER LONG RIFT SYSTEM, DISCOVERED BY MARINER NINE. MANY CHANNELS, RESEMBLING DRY RIVER BEDS, RUN OUT OF THIS ENORMOUS CANYON. THE CHRYSE SITE MAY HAVE BEEN A DRAINAGE BASIN FOR MANY OF THOSE RIVERS. SOME SCIENTISTS THINK IT MAY BE A DRY LAKEBED, CONTAINING SEDIMENTS CARRIED THERE BY THE RIVERS IF, INDEED, AT ONE TIME WATER FLOWED IN THEM. AND THE PRESENCE OF WATER, OF COURSE, INCREASES THE CHANCES FOR LIFE TO DEVELOP.

VOICE: THE ALTERNATE LANDING SITE FOR THE FIRST VIKING -- IN CASE
(CONT'D) CHRYSE SHOULD APPEAR UNSUITABLE -- IS A PLACE CALLED TRITONIS LACUS, AT TWENTY DEGREES NORTH AND TWO-HUNDRED-FIFTY-DEGREES WEST.

THE SECOND VIKING IS DUE TO LAND ON SEPTEMBER FOURTH, AT A LOCATION MUCH FARTHER NORTH THAN THE FIRST ONE. CYDONIA, LOCATED AT FORTY-FOUR DEGREES NORTH LATITUDE AND TEN DEGREES WEST LONGITUDE, ABOUT SIXTEEN-HUNDRED KILOMETERS OF THE FIRST VIKING LANDING SITE, IS MUCH MORE LIKELY TO CONTAIN WATER.

MARS HAS WATER VAPOR IN ITS ATMOSPHERE, AND THE POLAR CAPS ARE BELIEVED TO BE COVERED BY WATER ICE. CYDONIA, WHICH IS LOCATED AT THE EDGE OF THE NORTH POLAR CAP -- THE MARTIAN POLAR REGIONS BEING MUCH MORE EXTENSIVE THAN THOSE ON EARTH -- MAY WELL HAVE LIQUID WATER DURING THE SUMMER.

THE SECOND VIKING'S ALTERNATE LANDING SITE IS CALLED ALBA. IT TOO, IS LOCATED AT FORTY-FOUR DEGREES NORTH LATITUDE, NEAR THE EDGE OF THE POLAR ICE CAP, BUT MUCH FARTHER WEST, AT ONE-HUNDRED-AND-TEN DEGREES LONGITUDE.

IN THE EVENT THE FIRST VIKING ORBITER FINDS THAT REGIONS EVEN FARTHER TO THE NORTH APPEAR TO BE SAFE FOR A LANDING, THE SECOND VIKING MAY BE SENT THERE. THAT IS, IN FACT, WHAT BIOLOGISTS WOULD LIKE TO DO BECAUSE THEY BELIEVE THE LIKELIHOOD FOR FINDING LIFE IS MUCH GREATER IN THE NORTH.

(VIKING SCIENCE -- 3-3576 -- DOSA)

EDITOR: WE HAVE KNOWN FOR THE LAST FOUR YEARS, SINCE THE AMERICAN MARINER NINE PHOTOGRAPHED THE ENTIRE PLANET, THAT MARS IS A DYNAMIC CELESTIAL BODY, UNLIKE OUR DEAD MOON. THE TWO VIKING PROBES ON THEIR WAY TO SOFT LANDINGS ON MARS, SHOULD FILL IN MANY OF THE DETAILS OF OUR PICTURE OF THE RED PLANET. ----- REPORTS ON THE SCIENTIFIC GOALS OF VIKING.

VOICE: THE SEVEN-THOUSAND DETAILED PICTURES TAKEN BY MARINER NINE SHOW A PLANET COVERED BY CRATERED, MOON-LIKE HIGHLANDS, GIGANTIC VOLCANOES, AN IMMENSE CANYON EXTENDING ONE-FIFTH OF THE WAY AROUND THE PLANET'S CIRCUMFERENCE, RIVERBEDS WHERE WATER MAY HAVE FLOWED IN THE PAST, AND GLOBAL STORMS ENVELOPING ALL OF MARS IN DUST. THOSE MARINER NINE PHOTOGRAPHS HELPED THE SCIENTISTS FORMULATE THE QUESTIONS THE VIKING INSTRUMENTS WILL SEEK TO ANSWER.

THE SCIENTIFIC GOAL OF VIKING IS TO INCREASE OUR KNOWLEDGE OF MARS, WITH SPECIAL EMPHASIS ON THE SEARCH FOR EVIDENCE OF LIFE. THE OTHER SCIENTIFIC QUESTIONS DEAL WITH THE ATMOSPHERE, THE SURFACE, THE INTERIOR OF THE PLANET, AND THE CHEMISTRY OF MARS. AND MORE THAN ABSTRACT SCIENCE IS INVOLVED BECAUSE LEARNING OF THE MARTIAN ATMOSPHERE, FOR EXAMPLE, MIGHT HELP US UNDERSTAND OUR OWN.

THE QUESTION OF WATER ON MARS IS OF SPECIAL INTEREST. IT IS KNOWN THAT THERE IS WATER IN THE MARTIAN ATMOSPHERE BUT THE ATMOSPHERIC PRESSURE IS SO LOW -- ONE PERCENT OF THAT ON EARTH -- THAT IT IS NOT LIKELY TO BE ABLE TO SUSTAIN

VOICE: ANY LARGE BODIES OF LIQUID WATER. BUT THE PRESSURE OF A
(CONT'D) NETWORK OF RIVERBED-LIKE FEATURES SUGGESTS TO MANY
GEOLOGISTS THAT AT ONE TIME WATER FLOWED ON MARS.

GEOLOGISTS ARE ALSO INTERESTED IN MARS QUAKES AND VIKING
HAS SEISMIC INSTRUMENTS TO MEASURE SHOCKWAVES TRAVELING
THROUGH THE PLANET'S CRUST AND EVEN PINPOINT THEIR ORIGIN.
IF THERE ARE MANY MARS QUAKES, AND IF VIKING RECORDS THEM,
SCIENTISTS CAN BEGIN TO UNRAVEL THE INTERNAL STRUCTURE OF
THE PLANET.

THE MECHANICAL HAND OF THE VIKING LANDER -- THE DEVICE USED
TO SCOOP UP SOIL SAMPLES, IS EQUIPPED WITH A COUPLE OF
MAGNETS. IF MARTIAN DUST ADHERES TO THESE MAGNETS, SCIENTISTS
ON EARTH WILL IMMEDIATELY KNOW THAT IT CONTAINS IRON
PARTICLES. THE EARTH AND ITS MOON HAVE PLENTY OF IRON. SO
DO METEORITES REACHING OUR PLANET. MARS, TOO, IS EXPECTED
TO HAVE IRON, EITHER BY ITSELF OR IN MORE COMPLEX CHEMICAL
COMPOUNDS. THE ABUNDANCE OF IRON-BEARING MINERALS,
AND THEIR CHEMICAL COMPOSITION, MAY YIELD CLUES TO THE
OVERALL COMPOSITION OF THE PLANET.

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(THE SEARCH FOR LIFE -- 3-3576 -- DOSA)

EDITOR: OF ALL THE IMPORTANT SCIENTIFIC INVESTIGATIONS THAT THE
FIRST U-S VIKING SPACE PROBE WILL PERFORM ON MARS, THE
SEARCH FOR LIFE HAS ATTRACTED THE GREATEST INTEREST. HERE
IS ----- WITH THAT STORY.

VOICE: THE SEARCH FOR LIFE ON MARS IS BASED ON THE ASSUMPTION THAT IF THE RED PLANET HARBORS ANY LIFE AT ALL, IT IS LIKELY TO BE THE SIMPLEST FORM OF LIFE. MICROBES, BACTERIA, SINGLE-CELLED ORGANISMS ARE THE CHIEF TARGETS OF VIKING'S LIFE-SEEKING EXPERIMENTS.

THE VIKING BIOLOGICAL LABORATORY WILL ANALYZE MARTIAN SOIL SAMPLES WITH THREE DIFFERENT INSTRUMENTS. THE SAMPLES WILL BE COLLECTED BY A DEVICE NOT UNLIKE THE HUMAN HAND. ATTACHED TO A LONG ARM, IT CAN REACH AS FAR AS THREE METERS AWAY FROM THE LANDER TO SCOOP UP DIRT AND DROP IT INTO A HOPPER ON TOP OF THE AUTOMATIC LABORATORY.

IN THE FIRST EXPERIMENT, THE SOIL SAMPLE WILL BE EXPOSED TO VARIOUS GASES KNOWN TO EXIST IN THE MARTIAN ATMOSPHERE. NEXT, IT WILL BE PLACED UNDER ARTIFICIAL SUNLIGHT TO SEE IF PHOTOSYNTHESIS TAKES PLACE, THAT IS, TO SEE IF THE SOIL HARBORS LIFE FORMS THAT USE LIGHT TO CONVERT CARBON INTO ORGANIC MATTER.

IN THE SECOND BIOLOGY EXPERIMENT, THE MARTIAN SOIL SAMPLE WILL BE MIXED WITH SUGAR AND WATER. IF THE SOIL CONVERTS THE SUGAR AND WATER INTO ENERGY, IT MEANS THAT A METABOLIC PROCESS IS TAKING PLACE, INDICATING THE PRESENCE OF LIFE.

THE THIRD INSTRUMENT IN THE BIOLOGY LABORATORY FEEDS THE SOIL SAMPLE WITH ALL KINDS OF ORGANIC MOLECULES WHICH ARE COMMON ON EARTH. IF MARTIAN SOIL IS ANYTHING LIKE THE SOIL

VOICE: ON THIS PLANET, THE INSTRUMENT SHOULD DETECT A WIDE VARIETY
(CONT'D) OF METABOLIC PROCESSES.

VIKING SCIENTISTS ARE EXTREMELY CAUTIOUS ABOUT THEIR LIFE-SEEKING STUDIES. IF ANY OF THE INSTRUMENTS COMES UP WITH A POSITIVE RESULT, THE EXPERIMENT WILL BE REPEATED JUST TO BE CERTAIN ABOUT IT.

CORNELL UNIVERSITY PROFESSOR CARL SAGAN WROTE RECENTLY THAT "IF MARS HAS NOW OR EVER HAD LIVING THINGS, WE WILL HAVE FOR THE FIRST TIME IN HUMAN HISTORY AN OPPORTUNITY TO TEST THE GENERALITY OF THE PROCESS WHICH ON EARTH WE CALL LIFE. WE WILL BE ABLE TO DETERMINE HOW DIFFERENT FROM EARTHLY ORGANISMS LIFE CAN BE."

DOCTOR SAGAN ADDED THAT "WHATEVER FORM OF LIFE EXISTS ON MARS, ITS IMPLICATIONS FOR BIOLOGY AND FOR OUR VIEW OF OURSELVES WOULD BE BREATHTAKING: BECAUSE IF LIFE HAS INDEPENDENTLY ARISEN ON TWO RATHER DIFFERENT ADJACENT PLANETS, THE ARGUMENT THAT LIFE IS A COMMONPLACE IN THE MILKY WAY GALAXY WILL BECOME ALMOST COMPELLING. IF, ON THE OTHER HAND, MARS PROVES TO BE LIFELESS, WE HAVE THE CLASSIC SCIENTIFIC SITUATION: THE EXPERIMENT AND THE CONTROL. WE WILL THEN BE ABLE TO APPROACH THE IMPORTANT QUESTION OF WHY LIFE AROSE ON EARTH, BUT DID NOT ON MARS. THE ANSWER TO THAT QUESTION IS BOUND TO ILLUMINATE PROFOUNDLY OUR UNDERSTANDING OF THE ORIGIN OF LIFE."

(MARTIAN PHOTOGRAPHY -- 3-3576-- DOSA)

EDITOR: MOMENTS AFTER THE FIRST U-S VIKING SPACE PROBE TOUCHES DOWN ON THE PLANET MARS, IT WILL SEND BACK TO EARTH A PICTURE OF ITS SURROUNDINGS. ----- REPORTS ON MARTIAN PHOTOGRAPHY.

VOICE: THE VIKING LANDER WHICH WILL DESCEND TO THE SURFACE OF MARS, AS WELL AS THE ORBITER WHICH REMAINS IN ORBIT AROUND THE PLANET, WILL CARRY A NUMBER OF CAMERAS. THEY TOOK THEIR FIRST PICTURE OF MARS SEVERAL MONTHS AGO, WHILE STILL MANY MILLION KILOMETERS FROM THE PLANET. AND IN JUNE, AS THE FIRST VIKING WAS CLOSING IN ON MARS, IT STARTED TAKING AND SENDING BACK PICTURES WITH DAILY REGULARITY.

ONCE VIKING GOES INTO ORBIT AROUND MARS, THE CAMERAS ABOARD THE ORBITER WILL BE FOCUSED ON THE LANDING SITE. THE PICTURES THEY TAKE WILL HELP MISSION CONTROLLERS DETERMINE WHETHER THE INTENDED SITE IS SUITABLE FOR A SAFE TOUCHDOWN. AND AFTER VIKING HAS LANDED, CONTROL OF THE ORBITER CAMERAS WILL BE TURNED OVER TO SCIENTISTS WHO WANT TO RECEIVE DETAILED PICTURES OF VARIOUS FEATURES OF THE MARTIAN SURFACE.

THE VIKING LANDER IS EQUIPPED WITH TWO CAMERAS, POSITIONED ABOUT ONE METER APART. THE CAMERAS CAN BE AIMED BY REMOTE CONTROL FROM EARTH. SCIENTISTS HOPE TO OBTAIN THREE-DIMENSIONAL IMAGES OF THE MARTIAN SURFACE FEATURES BY TAKING SLIGHTLY OVERLAPPING PICTURES OF THE SAME SUBJECT, USING BOTH CAMERAS.

VOICE:
(CONT'D)

WITH THE USE OF VARIOUS FILTERS AND ELECTRONIC DEVICES, THE CAMERAS CAN TAKE EITHER BLACK-AND-WHITE OR COLOR PICTURES. THESE PICTURES CAN BE TRANSMITTED DIRECTLY TO EARTH OR RELAYED THROUGH THE VIKING ORBITER AS IT PASSES OVERHEAD. EACH PICTURE IS BROKEN DOWN BY A MECHANICAL SCANNING DEVICE INTO MANY TINY ELEMENTS FOR TRANSMISSION TO VIKING CONTROL AT THE SPACE AGENCY'S JET PROPULSION LABORATORY IN PASADENA, CALIFORNIA. THERE, A RECEIVING DEVICE WILL PUT THE INDIVIDUAL PICTURE ELEMENTS TOGETHER TO FORM A COMPLETE PICTURE.

THE VIKING CAMERAS OPERATE SLOWLY. THE TRANSMISSION OF THE PICTURES IS FURTHER DELAYED BY THE EIGHTEEN MINUTES IT TAKES FOR A RADIO SIGNAL TO REACH THE EARTH. BUT NOTHING WOULD PLEASE THE SCIENTISTS MORE THAN RECEIVING A PICTURE SHOWING A BLURRED OBJECT AGAINST A SHARPLY FOCUSED BACKGROUND. THAT WOULD MEAN THAT SOMETHING, OR SOMEBODY, WAS MOVING IN FRONT OF THE CAMERA. IT IS NOT EXPECTED TO HAPPEN BUT MANY SCIENTISTS SECRETLY HOPE THAT IT WILL.

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(MARTIAN METEOROLOGY OBSERVATIONS -- 3-357C -- DOSA)

EDITOR: THE U-S VIKING ON ITS WAY TO MARS GIVES MAN THE FIRST OPPORTUNITY TO MAKE DIRECT OBSERVATION OF THE WEATHER ON ANOTHER PLANET THAT OBEYS THE SAME PHYSICAL LAWS AS THE EARTH'S ATMOSPHERE. HERE IS ----- WITH A LOOK AT MARTIAN METEOROLOGICAL OBSERVATIONS.

VOICE: LESS THAN FIVE YEARS AGO, WHEN AMERICAN SCIENTISTS SENT MARINER NINE INTO ORBIT AROUND MARS, THE SPACECRAFT'S CAMERAS WERE BLINDED BY A GLOBAL DUST STORM THAT ENVELOPED THE WHOLE PLANET FOR SEVERAL WEEKS. THAT GAVE US A FORCEFUL PROOF THAT WEATHER ON MARS, JUST LIKE ON EARTH, IS SOMETHING WE MUST RECKON WITH.

AFTER THE VIKING LANDER TOUCHES DOWN ON THE SURFACE OF MARS, A RADIO COMMAND FROM EARTH WILL RELEASE A SPRING, AND A BOOM WILL BE EXTENDED FROM THE PROBE, MUCH LIKE A MAN EXTENDS AND STRETCHES OUT HIS ARM. AT THE END OF THE BOOM, WHERE THE HAND WOULD BE, IS A MINIATURE METEOROLOGICAL OBSERVATORY. ITS AUTOMATIC INSTRUMENTS WILL TAKE PERIODIC MEASUREMENTS -- TWENTY TIMES A DAY -- OF THE WIND SPEED, WIND DIRECTION, TEMPERATURE AND ATMOSPHERIC PRESSURE.

VIKING WILL MAKE IT POSSIBLE TO OBTAIN THE FIRST DIRECT MEASUREMENTS OF MARTIAN METEOROLOGY. UNTIL NOW, ALL INFORMATION ON WIND SPEEDS, FOR EXAMPLE, HAD TO COME FROM THEORETICAL CALCULATIONS OF THE CIRCULATION OF THE ATMOSPHERE. THE VIKING INSTRUMENTS WILL ALSO MEASURE AND DEFINE VARIATIONS IN THE WEATHER THROUGHOUT THE DAY.

THE NEW KNOWLEDGE METEOROLOGISTS OBTAIN ABOUT THE WORKINGS OF THE MARTIAN ATMOSPHERE -- SUBJECT TO SOLAR RADIATION AND THE ROTATION OF THE PLANET, JUST AS IT IS ON EARTH -- SHOULD LEAD TO A BETTER UNDERSTANDING OF OUR OWN ATMOSPHERE.

VOICE: THE METEOROLOGICAL OBSERVATORY WILL BE ENLISTED TO HELP
(CONT'D) WITH THE OTHER SCIENTIFIC ACTIVITIES OF VIKING. FOR
EXAMPLE, STUDIES OF THE MARTIAN WEATHER DURING THE FIRST
FEW DAYS AFTER THE LANDING ARE EXPECTED TO PROVIDE
INFORMATION AS TO THE MOST FAVORABLE PERIOD OF THE
MARTIAN DAY FOR THE COLLECTION OF SOIL SAMPLES. IT WOULD
BE MOST FRUSTRATING IF A SUDDEN GUST OF MARTIAN WIND WERE
TO BLOW AWAY THE HANDFUL OF DIRT SO CAREFULLY SCOOPED
UP BY VIKING'S MECHANICAL HAND FOR ANALYSIS BY VIKING'S
BIOLOGICAL LABORATORY.

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WJL/CAK